

Amendments to the Specification:

The following amendments to the Specification are based on the paragraph format and numberings from the substituted specification filed on September 1, 2004 and in the published application US 2005/0004331 A1.

Please replace paragraph [0001] with the following rewritten paragraph:

[0001] This is a continuation-in-part of International Application No. PCT/CN02/00425, with an international filing date of June 17, 2002 ~~Jul. 23, 2001~~.

Please replace paragraph [0002] with the following rewritten paragraph:

[0002] This invention provides a new class of catalysts (catalyst systems) used for olefin polymerization and copolymerization, their synthesis and utility as homogeneous catalysts (used directly without support ~~supporting~~) or as heterogeneous catalysts (used after supported on the solids materials such as macromolecular materials, silica, alumina, magnesium chloride, etc., or used as catalyst supported on polymer). The catalyst is based on the Group III ~~group 3~~ to Group XI ~~group 11~~ transition metal complexes of multidentate ligands.

Prior to paragraph [0005], please replace the section heading with the following rewritten section heading:

~~AIM~~ SUMMARY OF THE INVENTION

Please replace paragraph [0005] with the following rewritten paragraph:

[0005] The aim of the invention is to provide a new class of olefin polymerization and copolymerization catalysts (catalyst systems), which are the complexes based on Group III group 3 to Group XI group 11 transition metals and multidentate ligands.

Prior to paragraph [0008], please delete the section heading "SUMMARY OF THE INVENTION."

Please delete paragraph [0008].

Please add the following section heading and new paragraph after paragraph [0009] and just prior to the section heading that reads "DETAILED DESCRIPTION."

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 shows an X-ray diffraction of compound J-1.

Please replace paragraph [0010] with the following rewritten paragraph:

[0010] The present invention provides a new class of olefin polymerization and copolymerization catalysts (catalyst systems) and its preparation and usage in catalyzing the homopolymerization (including the oligomerization and copolymerization) of ethylene, α -olefin, and olefins containing functional group. It also provides the usage and the condition of polymerization about the said catalysts. The catalysts provided in this

invention are Group III ~~group 3~~ to Group XI ~~group 11~~ transition metal complexes of multidentate ligands.

Please replace paragraph [0019] with the following rewritten paragraph:

[0019] M is a Group III ~~group 3~~ to Group XI ~~group 11~~ transition metal, preferably ~~preferable to~~ Ti (IV), Zr (IV), Hf (IV), Cr (III), Fe (II, III), Co (II), Ni (II), or and Pd (II). The metal of Group IV ~~group 4~~ in the highest oxidative station is ~~are~~ preferred.

Please replace paragraph [0021] with the following rewritten paragraph:

[0021] X represents ~~represent the a~~ group including halogen atom, H, hydrocarbyl of C₁-C₃₀, substituted hydrocarbyl of C₁-C₃₀, group containing oxygen atom, group containing nitrogen atom, group containing sulfur atom, group containing boron atom, group containing aluminium atom, group containing phosphorus atom, group containing silicon, group containing germanium atom, or group containing selenium atom[,]. ~~each~~ Each X in the formula may be same or different, and they may link to one another to form covalent bond or to form a ring;

Please replace paragraph [0026] with the following rewritten paragraph:

[0026] -PR²⁸R²⁹, -P(O)R³⁰R³¹, sulfuryl, sulfoxidyl, or -Se(O)R³⁹;

Please replace paragraph [0030] with the following rewritten paragraph:

[0030] or -P(O)R³²(OR³³), in which ~~wherein~~, O, S, Se, N, P are coordinate atoms,
respectively;

Please replace paragraph [0031] with the following rewritten paragraph:

[0031] E is a group containing nitrogen atom, group containing oxygen atom, group containing sulfur atom, group containing selenium atom, or group containing phosphorus atom, and N, O, S, Se, P are coordinate atoms, respectively;

Please replace paragraph [0032] with the following rewritten paragraph:

[0032] F is a group containing nitrogen atom, group containing oxygen atom, group containing sulfur atom, group containing selenium atom, or group containing phosphorus atom, and N, O, S, Se, P are coordinate atoms, respectively;

Please replace paragraph [0033] with the following rewritten paragraph:

[0033] G is an inert group[,] including hydrocarbyl of C₁-C₃₀, substituted hydrocarbyl of C₁-C₃₀, or inert functional group;

Please replace paragraph [0034] with the following rewritten paragraph:

[0034] Y[,] and Z each represent a group ~~respective are groups~~ containing nitrogen atom, group ~~groups~~ containing sulfur atom, group ~~groups~~ containing oxygen atom, group ~~groups~~ containing phosphorus atom, or group ~~groups~~ containing selenium atom, such as -

$\text{NR}^{23}\text{R}^{24}$, $-\text{N}(\text{O})\text{R}^{25}\text{R}^{26}$, $-\text{PR}^{28}\text{R}^{29}$, $-\text{P}(\text{O})\text{R}^{30}\text{R}^{31}$, $-\text{OR}^{34}$, $-\text{SR}^{35}$, $-\text{S}(\text{O})\text{R}^{36}$, SeR^{38} , and -
 $\text{Se}(\text{O})\text{R}^{39}$;

Please replace paragraph [0037] with the following rewritten paragraph:

[0037] — Refers refers to covalent bond or ionic bond;

Please replace paragraph [0039] with the following rewritten paragraph:

[0039] $\text{R}^1, \text{R}^2, \text{R}^3, \text{R}^4, \text{R}^6, \text{R}^7, \text{R}^8, \text{R}^9, \text{R}^{10}, \text{R}^{11}, \text{R}^{12}, \text{R}^{13}, \text{R}^{14}, \text{R}^{15}, \text{R}^{16}, \text{R}^{17}, \text{R}^{18}, \text{R}^{19}, \text{R}^{20},$
 $\text{R}^{21}, \text{R}^{22}, \text{R}^{23}, \text{R}^{24}, \text{R}^{25}, \text{R}^{26}, \text{R}^{27}, \text{R}^{28}, \text{R}^{29}, \text{R}^{30}, \text{R}^{31}, \text{R}^{32}, \text{R}^{33}, \text{R}^{34}, \text{R}^{35}, \text{R}^{36}, \text{R}^{38}, \text{R}^{39}$ are each
represent H, hydrocarbyl of $\text{C}_1\text{-C}_{30}$, halogen, or substituted hydrocarbyl of $\text{C}_1\text{-C}_{30}$ among
which the halogen substituted hydrocarbyl are preferred, such as $-\text{CH}_2\text{Cl}$, $-\text{CH}_2\text{CH}_2\text{Cl}$, or inert functional group. These groups may be same or different, and the
adjacent groups such as R^1 with R^2, R^3 ; R^3 with $\text{R}^4, \text{R}^6, \text{R}^7, \text{R}^8, \text{R}^9$, and R^{23} with R^{24} or R^{25}
with R^{26} may form a covalent bond or to form a cycle;

Please replace paragraph [0040] with the following rewritten paragraph:

[0040] R^5 is a lone pair of electrons ~~electron~~ of nitrogen atom, H, hydrocarbyl of $\text{C}_1\text{-C}_{30}$,
substituted hydrocarbyl of $\text{C}_1\text{-C}_{30}$, group containing oxygen atom including hydroxyl,
hydrocarbyloxy group $-\text{OR}^{34}$, hydrocarbyl containing $-\text{T-OR}^{34}$, group containing sulfur
atom including $-\text{SR}^{35}$, $-\text{T-SR}^{35}$, group containing nitrogen atom including $-\text{NR}^{23}\text{R}^{24}$, $-\text{T-}$
 $\text{NR}^{23}\text{R}^{24}$, or group containing phosphorus atom including $-\text{PR}^{28}\text{R}^{29}$, $-\text{T-PR}^{28}\text{R}^{29}$, $-\text{T-}$
 $\text{P}(\text{O})\text{R}^{30}\text{R}^{31}$ [;]. When R^5 is a group containing oxygen atom, group containing sulfur

atom, group containing nitrogen atom, group containing selenium atom, or group containing phosphorus atom, the N, O, S, P, Se atom in the group may coordinate with M₁ respectively.

Please replace paragraph [0041] with the following rewritten paragraph:

[0041] T is a hydrocarbyl of C₁-C₃₀ ~~or~~, substituted hydrocarbyl of C₁-C₃₀ ~~may be~~, or an inert functional group.

Please replace paragraph [0042] with the following rewritten paragraph:

[0042] The catalyst system provided in this invention means the system containing the said catalyst. The system and it comprises six classes including simply 1, or 4, or 1 ~~1~~ or ~~4~~ or ~~1~~ supported on 2, [2] or contacting 1 and 3, or 1 and 3 ~~1~~ and ~~3~~ or ~~1~~ and ~~3~~ supported on 2, [2] or contacting 3 and 4, ~~3~~ and ~~4~~; Reference numbers 1, 2, 3, and 4 ~~1~~, ~~2~~, ~~3~~ and ~~4~~ are described below:

Please replace paragraph [0043] with the following rewritten paragraph:

[0043] [~~1~~] 1: the catalyst showed in formula I;

Please replace paragraph [0044] with the following rewritten paragraph:

[0044] [~~2~~] 2: solid support ~~supports~~ including macromolecular support materials, inorganic oxide support materials such as silica, alumina, and titania, inorganic chloride

support materials such as magnesium chloride.[,] ~~It it also~~ may also be a mixture the mixtures of the said support materials;

Please replace paragraph [0045] with the following rewritten paragraph:

[0045] [3] 3: the co-catalyst W;

Please replace paragraph [0046] with the following rewritten paragraph:

[0046] [4] 4: catalyst supported on the polymer;

Please replace paragraph [0054] with the following rewritten paragraph:

[0054] $-PR^{28}R^{29}$, $-P(O)R^{30}R^{31}$, sulfuryl, sulfoxidyl, or $-Se(O)R^{39}$;

Please replace paragraph [0058] with the following rewritten paragraph:

[0058] $-P(O)R^{30}R^{31}$, or $-P(O)R^{32}(OR^{33})$, among them, O, S, Se, N, P are coordinate atoms, respectively;

Please replace paragraph [0059] with the following rewritten paragraph:

[0059] E is a group containing nitrogen atom, group containing oxygen atom, group containing sulfur atom, group containing selenium atom, or group containing phosphorus atom, among them, N, O, S, Se, P are coordinate atoms, respectively;

Please replace paragraph [0060] with the following rewritten paragraph:

[0060] G is an inert group[,] including hydrocarbyl of C₁-C₃₀, substituted hydrocarbyl of C₁-C₃₀, or inert functional group;

Please replace paragraph [0063] with the following rewritten paragraph:

[0063] R¹, R², R³ are each represent H, hydrocarbyl of C₁-C₃₀, halogen, or substituted hydrocarbyl of C₁-C₃₀ among which the halogen substituted hydrocarbyl are preferred, such as —CH₂Cl, —CH₂CH₂Cl, or inert functional group. These groups may be same or different, and the adjacent groups such as R¹ with R², R³; R³ with R⁴, R⁶, R⁷, R⁸, R⁹, and R²³ with R²⁴ or R²⁵ with R²⁶ may form a covalent bond or to form a cycle;

Please replace paragraph [0071] with the following rewritten paragraph:

[0071] -PR²⁸R²⁹, -P(O)R³⁰R³¹, sulfuryl, sulfoxidyl, or -Se(O)R³⁹;

Please replace paragraph [0073] with the following rewritten paragraph:

[0073] E is a group containing nitrogen atom, group containing oxygen atom, group containing sulfur atom, group containing selenium, or group containing phosphorus atom, among them, N, O, S, Se, P are coordinate atoms, respectively;

Please replace paragraph [0074] with the following rewritten paragraph:

[0074] F is a group containing nitrogen atom, group containing oxygen atom, group containing sulfur atom, group containing selenium atom, or group containing phosphorus atom, among them, N, O, S, Se, P are coordinate atoms, respectively;

Please replace paragraph [0075] with the following rewritten paragraph:

[0075] G is an inert group[,] including hydrocarbyl of C₁-C₃₀, substituted hydrocarbyl of C₁-C₃₀, or inert functional group;

Please replace paragraph [0076] with the following rewritten paragraph:

[0076] Y[,] and Z each represent ~~are~~ a group containing nitrogen atom, group containing sulfur atom, group containing oxygen atom, group containing phosphorus atom, or group containing selenium atom, such as -NR²³R²⁴, -N(O)R²⁵R²⁶, -PR²⁸R²⁹, -P(O)R³⁰R³¹, -OR³⁴, -SR³⁵, -S(O)R³⁶, SeR³⁸, and -Se(O)R³⁹;

Please replace paragraph [0079] with the following rewritten paragraph:

[0079] R¹, R², R³, R⁴, R⁶, R⁷, R⁸, R⁹, R¹⁰, R¹¹, R¹², R¹³, R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸, R¹⁹, R²⁰, R²¹, R²², R²³, R²⁴, R²⁵, R²⁶, R²⁷, R²⁸, R²⁹, R³⁰, R³¹, R³², R³³, R³⁴, R³⁵, R³⁶, R³⁸, R³⁹ are each represent H, hydrocarbyl of C₁-C₃₀, halogen, or substituted hydrocarbyl of C₁-C₃₀ among which the halogen substituted hydrocarbyl are preferred, such as —CH₂Cl, —CH₂CH₂Cl, or inert functional group. These groups may be same or different, and the adjacent groups such as R¹ with R², R³; R³ with R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, and R²³ with R²⁴ or R²⁵ with R²⁶ may form a covalent bond or to form a cycle;

Please replace paragraph [0080] with the following rewritten paragraph:

[0080] R^5 is a lone pair of electrons of nitrogen atom, H, hydrocarbyl of C_1-C_{30} , substituted hydrocarbyl of C_1-C_{30} , group containing oxygen atom including hydroxyl, hydrocarbyloxy group $-OR^{34}$, hydrocarbyl containing ethereal bond including $-T-OR^{34}$, group containing sulfur atom including $-SR^{35}$, $-T-SR^{35}$, group containing ~~N~~ nitrogen atom including $-NR^{23}R^{24}$, $-T-NR^{23}R^{24}$, or group containing ~~P~~ phosphorus atom including $-PR^{28}R^{29}$, $-T-PR^{28}R^{29}$, and $-T-P(O)R^{30}R^{31}$ [;]. When R^5 is a group containing oxygen atom, group containing sulfur atom, group containing nitrogen atom, group containing selenium atom, or group containing phosphorus atom, the N, O, S, P, Se atom in the group may coordinate with M, respectively.

Please replace paragraph [0081] with the following rewritten paragraph:

[0081] T is a hydrocarbyl of C_1-C_{30} ~~or~~, substituted hydrocarbyl of C_1-C_{30} ~~may be~~, or an inert functional group.

Please replace paragraph [0082] with the following rewritten paragraph:

[0082] The said "metal complex" ~~can be represent~~ is represented by the formula (III):



Please replace paragraph [0085] with the following rewritten paragraph:

[0085] M is a Group III group-3 to Group XI group-11 transition metal, preferably ~~preferable to~~ Ti (IV), Zr (IV), Hf (IV), Cr (III), Fe (II, III), Co (II), Ni (II), or and Pd (II). The metal of Group IV group-4 in the highest oxidative station is ~~are~~ preferred.

Please replace paragraph [0086] with the following rewritten paragraph:

[0086] X ~~represents is the a group including~~ halogen atom, H, hydrocarbyl of C₁-C₃₀, substituted hydrocarbyl of C₁-C₃₀, group containing oxygen atom, group containing nitrogen atom, group containing sulfur atom, group containing boron atom, group containing aluminium atom, group containing phosphorus atom, group containing silicon atom, group containing germanium atom, or group containing selenium atom[,], ~~each~~
Each X in the formula may be same or different, and they may link to one another to form covalent bond or to form a ring;

Please replace paragraph [0087] with the following rewritten paragraph:

[0087] The ~~said halogen atom include~~ may be F[,], Cl, Br, or I.

Please replace paragraph [0089] with the following rewritten paragraph:

[0089] The catalysts (catalyst systems ~~system~~) provided in this invention may catalyze olefin polymerization as homogeneous catalyst (used directly without support ~~supporting~~) or heterogeneous catalyst (supported on macromolecular materials, silica, alumina, magnesium chloride, etc., ~~or~~ the mixtures of several supports, or used as catalyst supported on the polymer). The ~~said~~ polymerization includes oligomerization, homopolymerization, and copolymerization, and the catalysts (catalyst systems ~~system~~) may be used by itself or in the presence of a co-catalyst.

Please replace paragraph [0090] with the following rewritten paragraph:

[0090] In the polymerization process, the polymerization temperature is preferably ~~preferable~~ from about -100°C[.] to about 200°C[.], and the polymerization process provided in this invention at least includes contacting 4 4 with 1 1, or contacting 4 4 with 5 5, or contacting 4 4 with 1 1 supported on 2 2 in certain order[.], 3 3 ~~also~~ may also be involved in the process. Reference numbers 1, 2, 3, 4 1, 2, 3, 4, and 5 5 are described below:

Please replace paragraph [0091] with the following rewritten paragraph:

[0091] [1 1] 1: the catalyst showed in formula I;

Please replace paragraph [0092] with the following rewritten paragraph:

[0092] [2 2] 2: the solid supports;

Please replace paragraph [0093] with the following rewritten paragraph:

[0093] [3 3] 3: the co-catalyst W;

Please replace paragraph [0094] with the following rewritten paragraph:

[0094] [4 4] 4: olefin monomer;

Please replace paragraph [0095] with the following rewritten paragraph:

[0095] [5 5] 5: the catalyst supported on the polymer.

Please replace paragraph [0099] with the following rewritten paragraph:

[0099] The temperature at which the polymerization process may be conducted is from – 50°C[.] to 150°C[.], preferably preferred 0°C[.] to 120°C[.] for higher activity and productivity.

Please replace paragraph [0105] with the following rewritten paragraph:

[0105] The term "catalyst system" in this invention means the system comprising six classes including simply 1, or 4, or 1 ~~1 or 4 or 1~~ supported on 2, [2] or contacting 1 with 3, or 1 with 3 ~~1 with 3 or contacting 1 with 3~~ supported on 2 [2] in certain order, or contacting 3 with 4, 3 with 4[;]. Reference numbers 1, 2, 3, and 4 ~~1, 2, 3 and 4~~ are described below:

Please replace paragraph [0106] with the following rewritten paragraph:

[0106] [Φ] 1: the catalyst showed in formula I;

Please replace paragraph [0107] with the following rewritten paragraph:

[0107] [Φ] 2: solid support including macromolecular support materials, inorganic oxide support materials such as silica, alumina, and titania, inorganic chloride support materials such as magnesium chloride[.]. It it also may also be a mixture ~~the mixtures~~ of the said support materials;

Please replace paragraph [0108] with the following rewritten paragraph:

[0108] [3] 3: the co-catalyst W;

Please replace paragraph [0109] with the following rewritten paragraph:

[0109] [4] 4: catalyst supported on the polymer.

Please delete paragraph [0130] and the immediate preceding section heading

"DESCRIPTION OF THE FIGURE."